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Global research on information literacy: a bibliometric analysis from 2005 to 2014

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Abstract

Purpose – The purpose of this paper is to examine the literature published on information literacy (IL) from 2005 to 2014 and reveal the key aspects of IL publication trends.

Design/methodology/approach – The study analyses the literature indexed in Web of Science database on IL from 2005 to 2014 and used the required bibliometric measures to analyse specific aspects of publishing trends.

Findings – The findings of the study reveal that increase in literature on IL from 2005 to 2014 was noticed. A high amount of annual growth of literature on IL is observed for the year of 2007, 2008 and 2011. "Pinto, M" and the "University of Granada, Spain" was productive author and institute. Journal of Academic Librarianship was the most productive journal, with 97 articles being published for the period. USA was the most contributing country. "Digital divide", "media literacy", "pedagogy", "higher education" and "critical thinking" were current research topics in the IL domain.

Originality/value – The paper is very useful for researchers to learn about trends in the literature on IL, as well as possible areas for further research, and it provides the names of the most productive authors, organizations and countries, along with the most popular IL keywords.

Keywords Research, Digital literacy, Bibliometric analysis, Information literacy, Mapping

Paper type Research paper

Introduction

The phrase *information literacy* (IL) was first introduced by Zurkowski, the President of the Information Industry Association, in 1974 (Zurkowski, 1974). The National Forum on Information Literacy defined the phrase as:

> […] the ability to know when there is a need for information and to be able to identify, locate, evaluate and effectively use that information for the issue or problem that at hand (Ferguson, 2005).

In other words, IL encompasses skills and the ability of a person to identify, locate, evaluate and use the required information effectively as and when required. According to the American Library Association's Presidential Committee, "to be information literate, one must be able to identify, locate, and use it properly when it is needed" (ACRL, 2005). Baro and Zuokemefa (2011) defined the information literate are those "people who recognize their own need for good information, and who have the skills to identify, access, evaluate, synthesize and apply the needed information".

IL is vital for students, teachers, doctors, engineers, lawyers, judges, politicians, scientists, administrative officers, school children, businessman, industrial workers and common citizens to do extremely well in their respective field. Recognizing the significance of IL in higher education, numerous authors had highlighted the significance in the current era (Mulla, 2014; Parvathamma and Pattar, 2013; Sevukan and Gomathy, 2015; Shoeb, 2011; Ubogu, 2011; Wang, 2011). A model curriculum is proposed to impart digital literacy skills (basic and cognitive) to the students of Master of Business Administration by Parvathama

and Pattar. Similarly, the IL integration model was developed based on practical experience in higher education by Wang (2011).

The word *bibliometrics* has been derived from the Latin and Greek words "biblio" and "metrics", which refer to the application of mathematics to the study of bibliography. Bibliometric analysis serves as a useful tool in assessing the quality of a journal and its articles (Thanuskodi, 2010). According to Durieux and Gevenois (2010, p. 342), "Bibliometrics is a set of mathematical and statistical methods engaged to analyse and measure the quantity and quality of books, articles and other forms of publications". Bibliometric studies are increasingly being used for the research assessment of a particular area of research (Singh *et al.*, 2007), or person or organization (Maharana, 2013) or country (Zhu and Willet, 2011). To review research performance, several indicators are used in bibliometric studies.

> There are three types of bibliometric indicators: quantity indicators, which measure the productivity of a particular researcher; quality indicators, which measure the quality (or "performance") of a researcher's output; and structural indicators, which measure connections between publications, authors and areas of research (Durieux and Gevenois, 2010, p. 342).

Pritchard (1969, p. 348) defined *bibliometrics* as the "application of mathematical and statistical methods to the entire scientific literature, books and other materials". In other words, it is a process of organization, classification and quantitative evaluation of the publication pattern of macro-communication, along with their authorship pattern, by mathematical and statistical calculations.

In the present research paper, the author used bibliometric analysis as the technique to analyse published work on information literacy from 2005 to 2014, with the intention of providing a better understanding of research outputs on IL, even though many authors (Aharony, 2010; Johnson *et al.*, 2012; Kondilis *et al.*, 2008; Kumari *et al.*, 2015; Nazim and Ahmad, 2007; Panda *et al.*, 2013; Pinto *et al.*, 2013) had already conducted studies to understand IL research trends in by using bibliometric methods: this study is different from their studies in objectives, period covered and approach adopted.

Review of the literature
Nazim and Ahmad (2007) conducted a study to analyse 607 journal articles in the *Library and Information Science Abstracts (LISA) Plus* database, by means of "information literacy" as a search term with no date restrictions. They established that there was a clear increase in the number of publications between the 1980s and early 2000s. Most articles in this study were in the English language (88.3 per cent) and published in the USA (51.2 per cent). In total, 32 countries had published articles on IL. Correspondingly, Kondilis *et al.* (2008) examined and compared the research productivity on selected fields related to health literacy of the current members of the European Union (EU), in the four candidate countries waiting to join the EU, Norway, Switzerland and the USA. The study revealed that the 25 European countries produced less than one-third of the health literacy research when compared to the USA. The Netherlands and Sweden (followed by Germany, Italy and France) are the European countries with the highest number of research published in fields related to health literacy.

Aharony (2010) analysed 1,970 documents, published between 1999 and 2009, on "information literacy" as a topic in the *Web of Science* database. He found that most of the documents were in the English language (96.3 per cent) and that most documents were published in the USA (54.1 per cent), with England a distant second and other countries even further behind. Further, he noted that IL publications were generally increasing over time, and that issues in health and medicine have become important areas of focus for IL researchers. Johnson *et al.* (2012) examined 3,527 articles contained in the annual

bibliography from 2001 to 2010 and identified 2,052 that were published in peer-reviewed journals. Using the 2,052 articles identified as peer reviewed, the authors then determined the location of the primary author, the journal that published the article, whether the journal was from the discipline of library science, what type of research the article contained and the key themes present. They further found that the number of articles in peer-reviewed journals has grown substantially over the 10-year period. Most articles (70 per cent) were published by authors residing in the USA, but articles from Asia and Africa are now being seen on a more consistent basis. *Reference Services Review* has published the most articles on this topic during the period, but IL has also branched out into other non-library-specific disciplines. Key themes continued to be collaboration, assessment and the application of technology to instruction efforts. Panda *et al*. (2013) analysed publication and citation patterns in the *Journal of Information Literacy* (JIL), an open access journal, from 2007 to 2012. They found that a majority of contributions, 94 (71.7 per cent), emanating from the UK and other countries have had very meagre contributions. Almost all the papers, 124 (94.6 per cent), were from academic institutions and a very few papers, 7 (5.4 per cent), were from non-academic institutions. The citations demonstrated that individual research, 90 (68.7 per cent), is much higher than collaborative research. Claudene *et al*. (2013) provided a selected bibliography of recent resources on library instruction and IL that included source. The paper discussed the characteristics of current scholarship and described sources that contain unique scholarly contributions and quality reproductions.

Kumari *et al*. (2015) attempted to identify the bibliometric characteristics of articles published in various journals from *Web of Knowledge* during the study period 1999-2013. The results showed that the most prolific author was "Julien Heidi" with 21 (1.6 per cent) articles and "Pinto Maria" with 19 (1.5 per cent). The continent of America ranked first by contributing 690 (52.4 per cent) articles, followed by the European continent in the second position with 338 (25.7 per cent). Among the keywords appearing in the publications, the most frequently used were "information literacy", with 221 (24.1 per cent) publications, followed next by "information", with 38 (4.1 per cent) publications. Pinto *et al*. (2013) examined the international scientific productivity on IL since its inception in 1974 until late 2011, based on a bibliometric analysis of scientific articles included in the *Web of Science* and *Scopus* databases. The sample comprised two macro domains, the most productive and the least productive. The former was the area of social sciences (SoS), covering such disciplines as information and documentation, communication, education, management and so forth. The latter was the area of health sciences (HeS), covering such disciplines as medicine, nursing and so on. The study found that there was exponential growth of the scientific publications in both domains ($R^2 = 0.9544$ for SoS and $R^2 = 0.9393$ for HeS), with a predominance of Anglo-Saxon authors. Author productivity was low (1.29 and 1.12 papers/author), while the dispersion of articles by journal averaged 4.96 in SoS and 1.86 in HeS. Scientific collaboration exceeded 53 per cent in the SoS domain and 69 per cent in HeS.

Objectives of the study
Based on the significance of IL and increased publication activity on this subject, it was decided to carry out a bibliometric analysis of scientific outputs in this area. The major objectives were to study: publication types and language distribution of articles for the period 2005-2014; year distribution of articles; most productive authors, institutions and countries; most productive journals; and popular keywords and characteristics of the top 10 most cited articles.

Methodology
The data for the present study are derived from the *Web of Science*, the core collection of Thomson Reuter's database. According to the *Journal of Citation Reports* (JCR), in 2014, it indexed 11,761 journals with citation references. A keyword search was performed to identify literature on the topic to locate publications published from 2005 to 2014 that contained these words "information literacy", "media literacy" and "digital literacy" in their title and/or keyword and topic fields. Using the abovementioned search strategy, a total of 1,909 publications were retrieved from the *Web of Science*. Out of them, 1,503 publications were research articles. These articles were downloaded into a Microsoft Excel spreadsheet. Further, the analysis is restricted to these research articles. All results were analysed using Microsoft Excel 2007. In subsequent analysis, articles originating from England, Scotland, Northern Ireland and Wales were classified as being from the UK. Articles from Hong Kong before 1997 were classified as being from China. Articles from the Federal Republic of Germany (Fed Rep Ger) and Germany were reclassified as being from Germany (Ho, 2012). The impact factors were taken from the JCR published in 2014. The articles from institutions and countries were identified by the appearance of at least one author in the publications. Collaboration type was determined from the addresses of the authors. The articles were classified into six types based on the country and institution (Han and Ho, 2011):

(1) "single country article", if the researchers' addresses were from the same country;

(2) "single institution article", if the researchers' addresses were from the same institution;

(3) "internationally collaborative article", if the article was co-authored by researchers from multiple countries (Chiu and Ho, 2005);

(4) "inter-institutionally collaborative article", if authors were from different institutions;

(5) "first author article", if the first author's address was from a certain country or institution for analysis; and

(6) "corresponding author article", if the corresponding author's address was from a certain country or institution for analysis.

TP, IP, CP, FP, RP and SP are the number of total articles, "single country articles" or "single institution articles", "internationally collaborative articles" or "inter-institutionally collaborative articles", "first author articles", "corresponding author articles" and "single author article", respectively. In *Web of Science*, the corresponding author is labelled as "reprint author"; however, the research shown in this paper uses the term "corresponding author". The first author, the corresponding author and single author are not mutually exclusive classifications. In single-author articles where authorship is unspecified, the single author is classified as the first author and as corresponding author. Analogous to this, in single institute articles, the single institute is classified as the first author institute and as the corresponding author institute.

Results and discussion
Document types and languages
Among the total 1,909 documents, eight document types were documented: research articles, proceeding papers, reviews, meeting abstracts, editorial materials, corrections, book reviews and letters; research articles being the most published (1,503), accounting for 81.2 per cent of the total publications. A total of 1,369 (91.1 per cent) of the articles were in the English language. This examination was consistent with the fact that English is the international

language and that the majority of *Science Citation Index* and *Social Science Citation Index* indexed journals are published in the English language (Liu *et al.*, 2011). Authors need to write in English to have their research published in the *Web of Science* indexed journals, as it is the most authentic and reputed indexing database. Because of a large number of articles published in English, the data here also seem to confirm that research on IL has been a popular research topic, as English is considered as the international language.

Publication outputs

The bibliometric analysis studies usually aim to identify the trends in a particular topic (Jabeen *et al.*, 2015) and journal (Kolle *et al.*, 2015). Figure 1 illustrates the publication trends in IL for the period 2005-2014. A consistent growth of literature on IL is observed from 2005 (66 articles) to 2014 (2,010 articles). A similar result was found in the case of bibliometric analysis of IL literature from 2003-2012 using the *Scopus* database (Majid *et al.*, 2015). There was a significant relationship between IL skills and use of electronic information resources (Adeleke and Emeahara, 2016). IL has gained a very important place in academic research in the library and information science subject area since the last decade. Citations are considered as indicators of quality of articles (Li and Ho, 2008). Figure 1 illustrates the average citations per article over the years from 2005 to 2014. The articles published in 2005 have received the highest rate of citations per article (13.7 per cent) and lowest rate (0.44 per cent) was recorded for the articles published most recently (2014). This result is
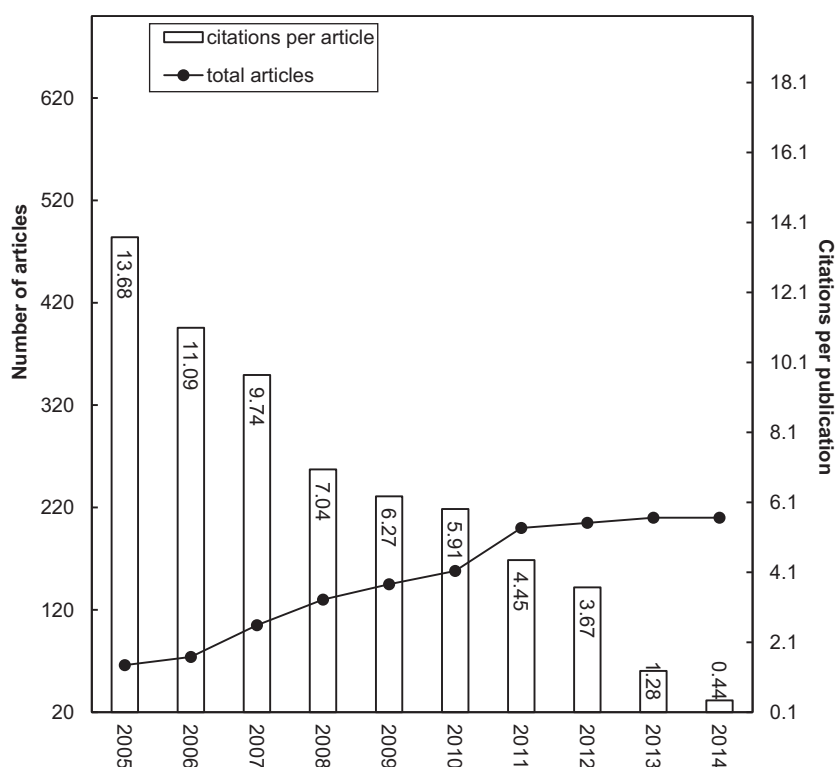
Figure 1.
Total articles and average citations over years

consistent and observed in a recent bibliometric study (Majid *et al.*, 2015). The articles need sufficient time to accumulate maximum citations (Li and Ho, 2008).

Scientific descriptors
Table I confirms Figure 1's results by providing more information in addition to the annual increase in the number of articles over the period. The number of documents cited per paper also increased in 2005, from 32.5, to 2014 (40.7). This again indicates that the research activities and also quality of the work have kept increasing from 2005 to 2014. A total of 19,789 pages of literature on IL were produced with the average page length of 13.2 per article. Average authors per article decreased in 2005, from 2.2, to 2009 (1.7) (Figure 2). Later (in 2010), it kept increasing onwards continuously.

Subject category outputs
Literature on IL published in 35 ISI-identified subject categories in the *Web of Science* database in the period 2005-2014 is examined to see the trends in publication on the topic (Figure 3). Four subject categories, Information Science & Library Science, Education & Educational Research, Computer Science and Communication, are the leading categories with the largest number of articles categorized. Some articles are categorized under two or three categories: for them, equal credit is assigned while analysing. Information Science & Library Science is the leading subject category, with 751 articles accounting for 49.9 per cent of the total articles, followed by Education & Educational Research (329, 21.8 per cent), Computer Science (178, 11.8 per cent) and Communication (163, 10.8 per cent), respectively. The trend shows some fluctuation in Information Science & Library Science; from 2005 to 2007, increasing trend is observed and later, some fall for 2008 and 2009 is noticed. Again, from 2009, it picks back up, and in 2012, some decreasing trend is shown. For the Education & Educational Research subject category, the articles kept increasing since 2006 and some fall is observed in 2010 and 2013, and again, from 2014, increasing trend is seen (Figure 3). The Computer Science subject category continues increasing trend and a fall is seen for the 2011 and 2013, and from 2014, it increases. For the Communication subject category, some average growth of articles is noticed since 2005. More than half of the literature on IL was categorized under Information Science & Library Science. It is clear that library and

PY	TP	NR	PG	TC	NR/PP	P/PG	C/PP
2005	66	2,147	917	903.00	32.53	13.89	13.68
2006	74	2,375	987	821.00	32.09	13.34	11.09
2007	105	3,280	1,441	1,023.00	31.24	13.72	9.74
2008	130	4,336	1,683	915.00	33.35	12.95	7.04
2009	145	4,420	1,744	909.00	30.48	12.03	6.27
2010	158	5,956	2,053	933.00	37.70	12.99	5.91
2011	200	7,651	2,841	890.00	38.26	14.21	4.45
2012	205	8,078	2,700	752.00	39.40	13.17	3.67
2013	210	8,308	2,696	269.00	39.56	12.84	1.28
2014	210	8,556	2,727	92.00	40.74	12.99	0.44
Totals	1,503	55,107	19,789	7,507.00	36.66	13.17	4.99

Table I.
Scientific descriptors

Notes: PY = publication year; TP = total articles; NR = number of references; PG = page counts; TC = total citations; NR/PP = average references per article; P/PG = average page counts per article; C/PP = average citations per article
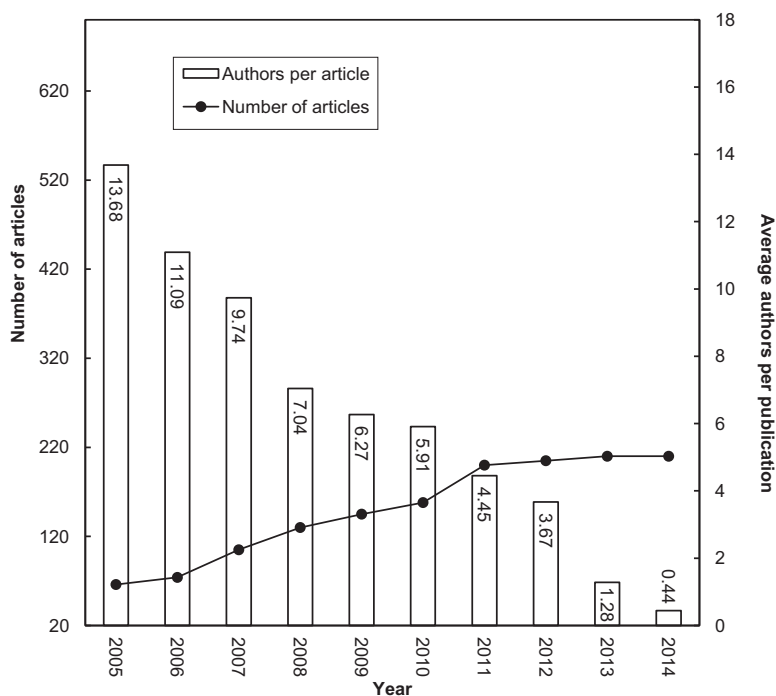
Figure 2.
Total articles with
average authors per
article over years

information science professionals are most actively engaged in the research on IL, followed by computer scientists and educationalists, respectively.

Most productive authors
Table II gives the detailed list of the top 12 productive authors sorted by the number of articles and rank, first-author articles and rank and corresponding-author articles and rank. A total of 2,694 authors had contributed 1,502 articles on IL with an average of 1.79 per article. One does not contain any author name. The first author actually made the most contributions and should thereby receive a greater proportion of the credit (Riesenberg and Lundberg, 1990; Marušić *et al.*, 2004). The corresponding author supervised the planning and execution of the study and the writing of the article (Burman, 1982). "Pinto, M" from University of Granada in Spain was the most productive author with 23 articles and takes the first rank in total articles, first-author articles and corresponding-author articles. "Lloyd, A" is from Charles Sturt University in Australia and emerged as the second most productive author, with 17 articles including 13 first author and 13 corresponding-author articles and secures second rank in all TP, FP, and RP, respectively. Similarly, "Primack, BA" from the University of Pittsburgh in the USA has contributed 14 articles and placed in third rank in the case of total articles, 10 first-author articles and 12 corresponding-author articles, respectively. "Julien, H" from the University of Alabama in the USA has also contributed 13 articles, with nine as articles as FP, and nine as articles as RP. Out of the 12 most productive authors, five authors were from USA-based institutions, two from Spain, two from Australia, two from Singapore and one from South Africa.
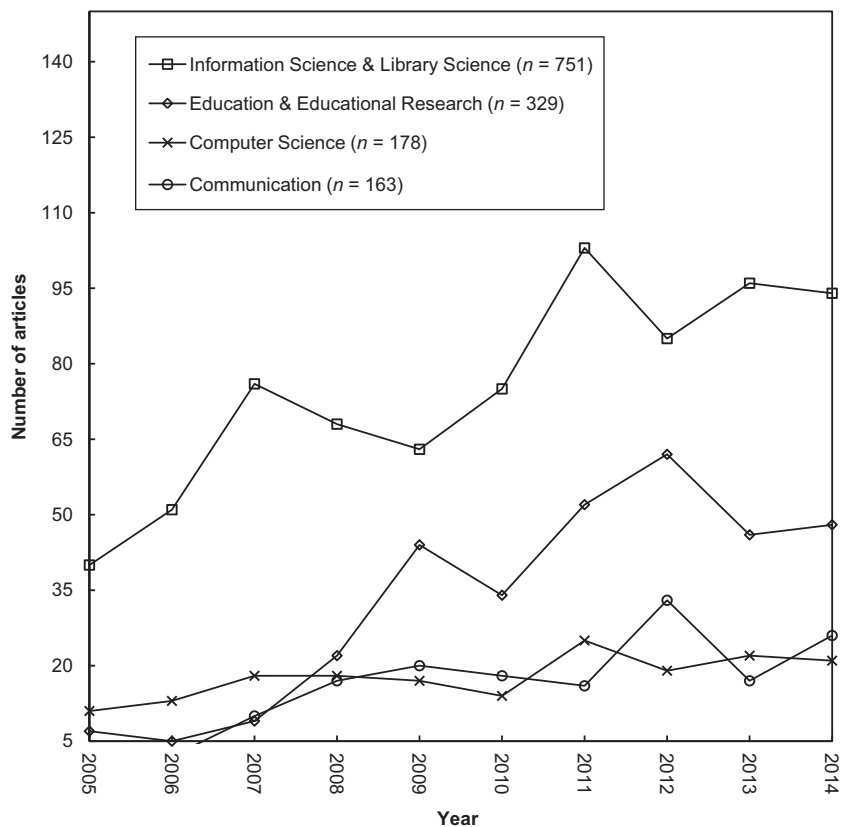
Author	Institution (FP or RP)	Rank (TP)	Rank (FP)	Rank (RP)
Pinto, M	University of Granada, Spain	1 (23)	1 (19)	1 (16)
Lloyd, A	Charles Sturt University, Australia	2 (17)	2 (13)	2 (13)
Primack, BA	University of Pittsburgh, USA	3 (14)	3 (10)	3 (12)
Julien, H	University of Alabama, USA	4 (13)	4 (9)	4 (9)
Bruce, C	Queensland University of Technology, Australia	5 (12)	8 (4)	7 (4)
Fourie, I	University of Pretoria, South Africa	6 (9)	5 (8)	5 (8)
Austin, EW	Washington State University, USA	7 (8)	8 (4)	7 (4)
Foo, S	Wee Kim Wee School of Communication and Information, Singapore	7 (8)	9 (2)	8 (2)
Gross, M	Florida State University, USA	7 (8)	6 (6)	6 (6)
Hargittai, E	Northwestern University, USA	7 (8)	7 (5)	7 (4)
Majid, S	Nanyang Technology University, Singapore	7 (8)	10 (1)	9 (1)
Sales, D	Universitat Jaume I, Spain	7 (8)	10 (1)	9 (1)

Notes: TP = total articles; FP = first-author articles; RP = corresponding-author articles

Most productive institutions
Bibliometric indicators, such as TP, IP, CP, FP and RP, to evaluate the research performance of institutions is applied recently (Ivanović and Ho, 2016). A total of 1,053 institutions had contributed their publication towards IL, with an average of 0.7 institutions per article. Table III presents the top 11 most productive institutions with 15 or more articles. Four institutions were from the USA, two from Australia, one from Spain, one from UK, one from Canada, one from Singapore and the remaining one from South Africa. The University of Granada in Spain is the most productive institution with 28 articles, secured first rank in total articles (28), inter-institutionally collaborative articles (19) and first-author articles (21). Charles Sturt University in Australia also has secured second rank in total articles (23) and takes first rank in the case of single-institution articles (18), first-author articles (21) and corresponding-author articles (19). The University of Pittsburgh in the USA takes the second rank in the case of inter-institutionally collaborative articles (14) and first-author articles (16). The University of Wisconsin ($n = 13$) and the University of Illinois ($n = 9$), both in the USA, have published an equal number of FP and RP, respectively.

Top ten contributing countries
Table IV shows the top 10 countries and regions in the world that produced the most articles on IL in the period from 2005 to 2014. A total of 75 countries had contributed towards IL research for the period. Bibliometric indicators, such as TP, IP, CP, FP and RP, to evaluate the research performance of countries are applied in recent times (Ivanović and Ho, 2016). Four articles do not have an author address in their field. The USA is ranked first in TP ($n = 575$), IP ($n = 508$), CP ($n = 67$), FP ($n = 527$) and RP ($n = 518$). This result is similar to the result of articles on photosynthesis (Yu *et al.*, 2012). The UK is the second most productive country in the case of total articles ($n = 164$), single-country articles ($n = 138$), first-author articles ($n = 145$) and corresponding-author articles ($n = 139$). Australia has emerged as second rank in the case of internationally collaborative articles ($n = 30$) and, in the remaining parameters, such as TP, IP, FP and RP, secured third rank. Sweden ($n = 7$ articles) and Taiwan ($n = 8$ articles) have made equal contributions (7) in the case of IP, FP and RP. It can be interpreted from these findings that the most developed countries are highly engaged in research on IL.

Institute	TP R (TP)	IP R (IP)	CP R (CP)	FP R (FP)	RP R (RP)	Country
University of Granada	1 (28)	6 (9)	1 (19)	1 (21)	2 (16)	Spain
Charles Sturt University	2 (23)	1 (18)	7 (5)	1 (21)	1 (19)	Australia
University of Pittsburgh, USA	3 (21)	8 (7)	2 (14)	2 (16)	5 (13)	USA
University of Alabama, USA	4 (20)	7 (8)	3 (12)	3 (15)	4 (14)	UK
Queensland University of Technology, Australia	5 (18)	2 (14)	8 (4)	2 (16)	3 (15)	Australia
University of Alberta	6 (18)	3 (13)	7 (5)	3 (15)	5 (13)	Canada
University of Wisconsin	7 (17)	7 (8)	5 (9)	4 (13)	5 (13)	USA
Nanyang Technology University	8 (16)	7 (8)	6 (8)	6 (11)	7 (10)	Singapore
University of Illinois	9 (16)	9 (6)	4 (10)	7 (9)	8 (9)	USA
University of Pretoria	10 (15)	4 (11)	8 (4)	5 (12)	6 (12)	South Africa
Washington State University	11 (15)	5 (10)	7 (5)	3 (15)	4 (14)	USA

Notes: TP = total articles; IP = single-institution articles; CP = inter-institutionally collaborative articles; FP = first-author articles; RP = corresponding-author articles

Table III.
Characteristics of the 11 most productive institutions (TP ≥ 15)

Country	TP R (TP)	IP R (IP)	CP R (CP)	FP R (FP)	RP R (RP)
USA	1 (575)	1 (508)	1 (67)	1 (527)	1 (518)
UK	2 (164)	2 (138)	3 (26)	2 (145)	2 (139)
Australia	3 (140)	3 (110)	2 (30)	3 (126)	3 (129)
Spain	4 (101)	4 (89)	5 (12)	4 (97)	4 (97)
Canada	5 (80)	5 (62)	4 (18)	5 (72)	5 (69)
South Africa	6 (36)	6 (28)	7 (8)	6 (31)	6 (30)
Brazil	7 (30)	9 (21)	6 (9)	9 (25)	10 (20)
Sweden	8 (29)	7 (25)	10 (4)	7 (28)	7 (27)
Peoples R China	9 (28)	9 (21)	8 (7)	9 (25)	9 (25)
Taiwan	10 (27)	8 (22)	9 (5)	8 (26)	8 (26)

Table IV.
Characteristics of the
10 contributing
countries

Notes: TP = total articles; IP = single-country articles; CP = internationally collaborative articles; FP = first-author articles; RP = corresponding-author articles

The probable reason for this may be due to the availability of adequate funds for research activities in developed countries rather than developing ones.

Most productive journals
Bibliometric indicators, such as TN, TN R (%), IF2014, TC, TC/TN, NR and NR/TN, by Liu *et al.* (2011) are used to evaluate the characteristics of journals publishing biodiversity research. The published literature on IL published in 389 journals and the top 10 most productive journals are presented in Table V, with the number of articles with citations that these journals received for the articles. The average citation rate of journals is the most direct indicator for assessing the impacts of journals (Liu *et al.*, 2011). The higher the citation rate per article is, the greater the journal's impact is to this field. The *Journal of Academic Librarianship* has published 97 articles on the IL topic, which accounts for the 6.5 per cent of the total articles indexed in *Web of Science* for the period 2005-2014 and takes the first rank. *Information Research-An International Electronic Journal* is the second most productive journal, with 51 articles followed by *Portal-Libraries and the Academy* (44), *College &*

Journal	TN	TN R (%)	IF2014	TC	TC/TN	NR	NR/TN
Journal of Academic Librarianship	97	1 (6.45)	0.448	460	4.74	3,313	34.15
Information Research	51	2 (3.39)	0.370	48	0.94	1,880	36.86
Portal-Libraries and the Academy	44	3 (2.93)	0.639	226	5.14	1,344	30.55
College & Research Libraries	42	4 (2.79)	1.206	234	5.57	1,427	33.98
Libri	40	5 (2.66)	0.175	150	3.75	1,499	37.48
Journal of Librarianship and Information Science	37	6 (2.46)	0.844	222	6.00	1,588	42.92
Journal of Documentation	36	7 (2.40)	0.833	425	11.81	1,652	45.89
The Electronic Library	30	8 (2.00)	0.535	98	3.27	776	25.87
Library & Information Science Research	28	9 (1.86)	1.153	250	8.93	1,425	50.89
Library Trends	28	9 (1.86)	0.386	66	2.36	1,052	37.57

Table V.
The 10 most active
journals in IL research

Notes: TN = total number of articles; TNR = total number rank; IF2014 = 2013 ISI impact factor; TC = total citation count; TC/TN = average of citations per article; NR = cited reference count; NR/TN = the average cited references count per article

Research Libraries (42), *Libri* (40), *Journal of Librarianship and Information Science* (27), *Journal of Documentation* (36), *The Electronic Library* (30), *Library & Information Science Research* (28) and *Library Trends* (28). The journal that published IL literature with higher impact has received the highest rate of citation per article (Table V). *Library & Information Science Research* (TC/TN = 8.93) and *College & Research Libraries* had a greater citation rate per article (TC/TN = 5.57), as they had higher impact factors of 1.153 and 1.206, respectively. The average cited references also correspond to impact factor and citation rate per article (Table V). The *Journal of Documentation* is the only journal which has 11.81 rate of citation among all. The journal need not be a high impact factor journal to receive higher citations.

Most cited top 10 articles
Table VI presents the most cited top 10 articles with (TC_{2014}) 60 or more citations. Four articles were contributed by a single author, four by joint authors and two by three authors. Four articles published in 2005, two in 2006, two in 2010, one in 2007 and the remaining one in 2009. The article entitled "Making sense of credibility on the web: models for evaluating online information and recommendations for future research" was the most cited article with 156 TC in 2014. The author is from the University of California at Santa Barbara in the USA. The article takes the first rank in ($TC_{2014} = 156$), ($C_{2014} = 25$) and ($TCPY = 15.6$). The article contributed by Lewis and Fabos (2005) also received 118 citations until 2014 and ranked second in the case of TC_{2014} and third in the case of TCPY with 9.83 citations per year. The authors are from the University of Minnesota in the USA. The article titled "On the rapid rise of social networking sites: new findings and policy implications" contributed by Sonia and David (2010) has received 60 citations in a small span of time, and it is also the only article which has received citations in the publication year ($C_0 = 3$): this article could emerge as the most highly cited article in the future. The authors of this article belong to the University of London in the UK. One more article that received a considerable number of citations in a limited time was contributed by Sonia and Ellen (2010). This article is ranked fourth in the case of average citations per year and second in the case of C_{2014} with 21 citations. The article may be the most cited article in the future, as it gained a good number of citations in just half of a decade. The citation lives of the top seven articles (TC2014 > 2,500) are shown in Figure 4. The articles published in 2005 had attracted more citations after three years of publication from 2007 to 2012 and again some fall is observed. The two articles published in 2010 started receiving a good number of citations from their second year of publication and the trend clearly indicates the probability of an increasing number of citations in the future. The article contributed by Metzger (2007) has attracted maximum citations up until 2013, and in 2014, some fall is noticed (Figure 4).
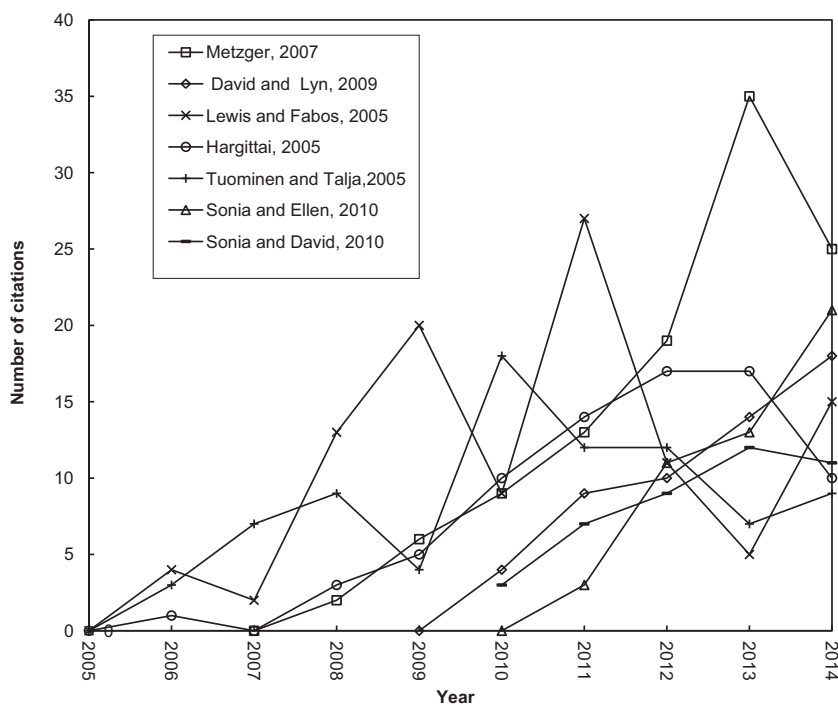
Most popular keywords
Figure 5 gives the list of top 25 most popular keywords in the literature published on IL based on the number of times they occur in the literature. "Information literacy" is the most popular keyword, which occurred more than 350 times. "Media literacy" is also one more phrase that occurred more than 150 times and "digital literacy" occurred more than 120 times in the literature for the period. Other phrases, such as "digital divide", "higher education" and "critical thinking", have occurred more than 50 times. The phrase "academic library" and "information retrieval" also exist in the literature at least 50 times. It indicates that major works were related to library literacy and media literacy. The assessment of IL among students in higher education is a new area of research in the subject. Media literacy is the burning issue in the computer science subject since the last decade; it may be due to advancements in information and communication technologies.

Rank (TC_{2014})	Rank (C_{2014})	(C_0)	Rank $(TCPY)$	Title	References
1 (156)	1 (25)	0	1 (15.6)	Making sense of credibility on the Web: models for evaluating online information and recommendations for future research	Metzger (2007)
2 (118)	4 (15)	0	3 (9.83)	Instant messaging, literacies and social identities	Lewis and Fabos (2005)
3 (92)	6 (10)	0	6 (7.67)	Survey measures of web-oriented digital literacy	Hargittai (2005)
4 (91)	7 (9)	0	7 (7.58)	Information literacy as a socio-technical practice	Tuominen et al. (2005)
5 (85)	3 (18)	0	2 (10.62)	The dark side of information: overload, anxiety and other paradoxes and pathologies	Bawden and Robinson (2009)
6 (85)	6 (10)	0	9 (7.08)	The Web as an information resource in K-12 education: strategies for supporting students in searching and processing information	Kuiper et al. 2005
7 (81)	8 (6)	0	8 (7.36)	Critical information literacy: implications for instructional practice	Elmborg (2006)
8 (65)	2 (21)	0	4 (9.29)	Balancing opportunities and risks in teenagers' use of the internet: the role of online skills and internet self-efficacy	Livingstone and Helsper (2010)
9 (61)	6 (10)	0	10 (5.55)	IL landscapes: an emerging picture	Lloyd (2006)
10 (60)	5 (11)	1 (3)	5 (8.57)	On the rapid rise of social networking sites: new findings and policy implications	Livingstone and Brake (2010)

Notes: TC_{2014} = number of citations up to 2014; C_{2015} = number of citations in 2014; C_0 = number of citations in publication year; TCPY = average citations per year

Table VI.
Ten most frequently cited articles of IL research

Figure 4.
Citation life cycle of
top cited seven articles
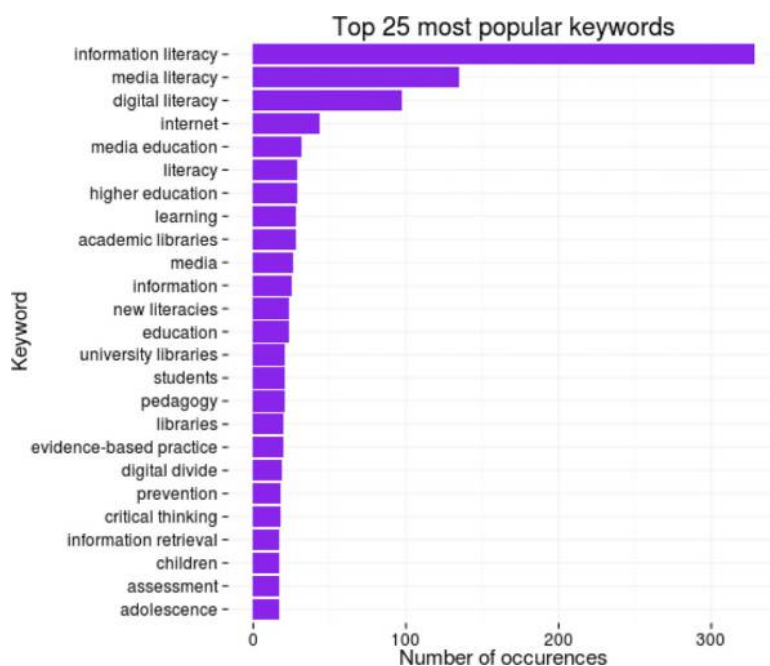
Figure 5.
Most popular
keywords

Conclusion

Bibliometric analysis of the articles published on IL indexed in *Web of Science* from 2005 to 2014 is presented in the study. A consistent growth of literature on IL is observed from 2005 (66 articles) to 2014 (2,010 articles). The articles published in 2005 have received the highest rate of citations per article (13.7) and the lowest rate (0.4) was recorded for the articles published most recently (2014). The number of documents cited per paper has also increased since 2005, from 32.5 to 2014 (40.7). Average authors per article kept decreasing since 2005, from 2.2 to 2009 (1.7). Later, it kept increasing from 2010 onwards continuously. "Pinto, M" from the University of Granada in Spain, was the most productive author, with 23 articles and takes the first rank in total articles, first-author articles and corresponding-author articles. The University of Granada in Spain is the most productive institution with 28 articles, secured first rank in total articles (28), inter-institutionally collaborative articles (19) and first-author articles (21). The USA is ranked first in TP ($n = 575$), IP ($n = 508$), CP ($n = 67$), FP ($n = 527$) and RP ($n = 518$). The *Journal of Academic Librarianship* has published 97 articles on the IL topic, which accounts for the 6.5 per cent of the total articles indexed in *Web of Science* for the period 2005-2014. The article entitled "Making sense of credibility on the web: models for evaluating online information and recommendations for future research" was the most cited article with 156 TC in 2014. "Information literacy" is the most popular keyword, occurring more than 350 times. Two other popular phrases were "media literacy", occurring more than 150 times, and "digital literacy" (120 times) in the literature for the period. Assessment of IL among students in higher education appears as a new area of IL research.

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